CLAIMS

We claim:

[c1] 1. A method of frequency estimation for a GSM communications system comprising:

(a) receiving a frequency control channel data burst;

(b) sampling said data burst into a plurality of subsets;

(c) filtering at least one of said plurality of subsets to generate a filtered subset;

(d) correlating each filtered subset and summing the result into a parameter r;

(e) updating a filter parameter of said filter using the parameter r;

(f) repeating steps (c) – (e) N iterations; and

(g) calculating an estimated frequency based upon the parameter r.

[c2] 2. The method of Claim 1 wherein said filtering is performed on each of said plurality of subsets.

[c3] 3. The method of Claim 1 wherein said filtering is by use of an auto-regressive filter.

[c4] 4. The method of Claim 3 wherein said auto-regressive filter is a one-pole filter.

[c5] 5. The method of Claim 2 wherein said filtering is by use of an auto-regressive filter.

[c6] 6. The method of Claim 1 wherein said estimated frequency is calculated by:

$$f = \frac{f_s}{2\pi} \cdot \frac{\angle r}{m}$$

where f is the estimated frequency, f_s is data frequency of said frequency control channel data burst, and m is an interval of correlation.

[c7] 7. The method of Claim 1, wherein said filter parameter is determined by:

$$a(k) = \beta e^{j \cdot \frac{\angle r}{m}}$$

where β is a forgetting factor and m is an interval of correlation.

[c8] 8. The method of Claim 1 wherein said parameter r is determined by:

$$r = \sum_k \sum_q y_k(q+m) \cdot y_k^*(q)$$

where q is the number of elements in said sampled subsets and m is an interval of correlation.

[c9] 9. An apparatus for frequency estimation in a GSM communications system comprising:

(a) means for receiving a frequency control channel data burst;

(b) means for sampling said data burst into a plurality of subsets;

(c) means for filtering at least one of said plurality of subsets to generate a filtered subset;

(d) means for correlating each filtered subset and summing the result into a parameter r;

(e) means for updating a filter parameter of said filter using the parameter r;

(g) means for calculating an estimated frequency based upon the parameter r.

[c10] 10. The apparatus of Claim 9 wherein said means for filtering is performed on each of said plurality of subsets.

[c11] 11. The apparatus of Claim 9 wherein said means for filtering is an auto-regressive filter.

[c12] 12. The apparatus of Claim 11 wherein said auto-regressive filter is a one-pole filter.

[c13] 13. The apparatus of Claim 10 wherein said means for filtering is an auto-regressive filter.

[c14] 14. The apparatus of Claim 1 wherein said means for calculating an estimated frequency operates by:

$$f = \frac{f_s}{2\pi} \cdot \frac{\angle r}{m}$$

where f is the estimated frequency, f_s is data frequency of said frequency control channel data burst, and m is an interval of correlation.

[c15] 15. The apparatus of Claim 9, wherein said filter parameter is determined by:

$$a(k) = \beta e^{j \cdot \frac{\angle r}{m}}$$

where β is a forgetting factor and m is an interval of correlation.

[c16] 16. The apparatus of Claim 1 wherein said parameter r is determined by:

$$r = \sum_{k} \sum_{q} y_k(q+m) \cdot y_k^*(q)$$

where q is the number of elements in said sampled subsets and m is an interval of correlation.